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AESTIVATION OF CALIFORNIAN MASON SPIDERS

BY MISS SARAH P. MONKS.

Æstivation is the peculiar habit that some animals of tropical climates have of retiring to dens, or nests, and remaining torpid, or semi-torpid, during the dry season. It is a state, closely allied to hibernation of animals of colder countries. The Germans call one winter, and the other, summer sleep. Late in autumn many animals—as, some bears, weasels, marmots, rats and hedgehogs—creep away into hollow trees, or caves, or burrows, or hollows in the earth, and remain in a state of suspended animation till the warm weather of spring; and snakes, turtles, toads and fishes, insects, and mollusks, hide under leaves, among rocks, or burrow in the mud, and stay dormant all the cold weather.

The sleep may be broken or continuous. In perfect hibernation, or æstivation, normal functions, such as respiration, digestion, and voluntary action of muscle, are entirely, or almost, suspended. It is said to be possible to keep a hibernating animal for a long time unharmed in gas that would soon destroy its life under ordinary conditions. The summer sleep closely resembles the winter sleep, and by some is thought to be due to the deathless memory of a boreal ancestry. Some fishes and mollusks are known to remain alive in mud burrows when all the water is evaporated from shallow ponds. Fish have even stayed for years in the mud of drained lakes and appeared as good as new when the water was again supplied. Hibernation and æstivation do not seem to depend upon heat or cold, although these are important factors. They seem rather provident arrangements incident to an empty, or much depleted, larder, and are habits that it might be well for some Anti-Poverty philanthropist to introduce into the human family. The dreamy stupor, the trance, the sleep of the Seven Sleepers, Rip Van Winkle's nap, and the slumber of the Sleeping Beauty, have been favorite fancies of the imaginative for ages, but they are repeated among lower animals with all the romance, beauty and sentimental or humorous fascination swept away. They are reduced to a food basis. If worms go down to the depths of the earth, and insects swing in cocoons, or lie motionless in pupal wrappings, or hidden in wooden cradles, then small mammalian people with insect-feeding tendencies must fold their little paws, and sleep their dreamless sleep, taking no note of time till crickets shrill and grasshoppers

whirr among the grasses of the sweet-scented eastern Spring or our tropical green December.

When the waters dry away, or freeze, then the food of water dwellers dries, or freezes also, or dies, and there is nothing for the eaters to do but to die, or sleep off the effects of nothing to eat. So also the gastric nerves of toad and reptile are more affected by minimum food than maximum cold; and scarcity of food, or difficulty in obtaining it, is the primary cause of hibernation of some species of bears.

The summer lifelessness of Californian foot-hills leads one to think that many animals here take long *siestas* even if they do not properly aestivate during the dusty dry season. A little patient investigation in this line would no doubt reveal some interesting facts.

The Mason spider is one of the best examples of persistent summering. It is eminently proper for the whole family to shut up doors in May, or June, and not open them till November, or later, if continuous rains do not come. At this time the adobe is cracked and fissured, vegetation is dry as hay, and mustard stalks and dry grass have been burned in many places, leaving the earth brown- and charcoal-stained. In fact, finding nests in these burned-over patches, with doors clogged with ashes and singed vegetation from the early summer fires, showing that they had not been opened since the burning, was one of the things that led me to suspect these spiders of summer sleeping. In some nests are females and young; in others single males or females; never two grown ones in one nest. The females shut themselves up to lay their eggs. In the tubes the young are hatched and moult once or twice. All the doors of small or medium sized tubes are securely fastened on the inside. If one is found unfastened, it is large and never contains a male or young. These open ones are probably occupied by misanthropic and independent old maiden or matron spiders that are utterly regardless of the "sweet observances" of spider high life, and perfectly able to protect themselves, come what may, in summer or winter. But comfort-loving males, mothers with very young children, and demure and decorous maidens and matrons, securely close the doors, pull down the blinds, let the dust gather on the door-steps and are severely not at home during the out-of-town season of the long, hot, dry and foodless summer months.

The closing of the nests is as complete as the other work of the little brown spinners. At the upper end of the inside of the tube they spin a stout white silk band, about a quarter of an inch wide, connecting the door with the sides of the nest. This silk ring is so strong that it requires considerable prying and force to tear it free. Large spiders are content with this protection. Small and medium sized

ones, whose doors swing easily off their hinges, build an inside storm door by bringing up earth from the bottom of the tube and pressing it up against the door, completely plugging up the place within the silken ring. Then, when the outer door is pried open instead of a tube, a patch of *adobe* is found that might lead some deluded Tarantula hawk, or spider-affinity creature into thinking there never had been a nest there, and tempt him to the conclusion of the olden time anti-geologists in regard to fossil shells, that the hinged door was merely a freak of nature.

It has been possible to examine a great number of nests and contents in a short time by means of a neat device suggested by a friend. The nests are filled with water and soaked a short time, then the silk lining can be loosened and twisted and pulled out entire. The *Oteniza* does not mind a ducking as much as does its relative the Tarantula (*Mygale*). The latter comes to the surface and tries to crawl away when water is poured in her nest; the mason spiders come up, but retire to the water on slightest alarm. When the spiders feel the walls and foundation of their homes sliding up, they place their feet against the sides and hold on with all their strength, and sometimes the silk breaks midway and leaves them in triumphant possession of their inundated houses. When they are pulled out the spider is half way up the tube, and on reaching the surface is so spread out with her efforts of resistance that the tube is nearly flat. By this soaking process the contents of the nests were easily examined, and a number of males found living singly in tubes. They generally had them shut with both silk and mud. I had the satisfaction of seeing males dig and shut up tubes, so that it is certain that sometimes, if not always, they make the tubes, instead of inheriting them from maternal ancestors. Finding a male in a silk- or mud-sealed nest did not prove that he had made the nest—only that he had spun the silk and fastened the door. He might have hidden there as in any hole or crevice. So I put a male in a jar of earth and watched him with a great deal of interest. He went to work like a gentleman and did what was expected of him. He built a nest. He worked industriously, but awkwardly, for his long legs seemed constantly in his way. When females are making a home they bring up the earth pressed under their fangs and dexterously fillip the bits out of the mouth of the tube, so that they fall several inches away. The males carry the dirt in the same way, but none that I saw work had learned the trick of tossing it away. Consequently, scraps of earth that he laboriously brought up would often fall back into the tube, because he did not push them far enough away from its mouth. He used his spinneret the same as females do. When the nest was completed he

did not build a hinged door, but was content to pull together grains of *adobe* and bits of dead weeds and stick them fast with silk to cover over the tube. These granulated doors serve excellently in broken soil, as they are as difficult to see as the better doors. The females make the same kind in summer. They never will work if they can help it, and if the nests are broken during the dry season, or the doors torn off, they spin silk over the openings. It was a satisfaction to learn that at least one male lived in a tube and could dig, spin and make a home for himself, but it was not proof that it is a masculine characteristic. He might have been an exception, a genius, or have taken after his mother, and not till I had seen several males do the same was I convinced that it was the regular order of business, and house work and home decoration were as proper for males as for females of this division of spiderdom. Much depends upon the soil given them. Sometimes in coarse grained earth they hollow out a cavity and line it with silk and back into the place, and sometimes they scratch up the small lumps of earth and pull together bits of straw and weave them together with silk and make caverns large enough in which to hide part of the body, but when they have adhesive *adobe* they prefer a good sized tube with a silken door. Only in a few instances have the males wasted their time in aimless and tiresome efforts to climb up the sides of a glass jar. The pains taken to secure their summer homes against intrusion, indicates wily and persistent foes. One of the invaders was found in a trap-door nest. In several tubes bits of yellow silk had been found. Trap-door spider's silk is white, or only dirty white when very old; never yellow. In one nest there was a dead wasp, wrapped in yellow silk, suspended across the tube. It had eaten the spider, finished its own larval life, spun its yellow silk across the nest, and hung its pupa case from a central point; then, when the time for it to break through the chrysalis and come forth a full grown wasp, it died, perhaps from the closeness of the air or from indigestion caused by eating too much spider. The facts on which I base the belief in aestivation are as follows: the doors of nests in the field show that they are not opened for months; in dug out tubes, broken places and broken doors are covered or replaced with continuous silk; the great majority of doors of field nests are held down with silk or silk and mud. Enough have been examined to lead to this conclusion. The numbers, examined three times, are as follows: Sept. 13, nineteen sealed with silk, six with mud and silk, four unsealed; again, Sept. 15, twenty-one with mud, twenty-seven silk, four unsealed; again, Sept. 17, thirty silk, thirty-six mud, six unsealed. About the same ratio was kept up in all examinations. They are so securely hidden in their nests, that their summer condi-

tion cannot be known. Whether they sleep all the time and satisfy the cravings of hunger by dreams of food to come, or sleep a while, then waken to hearken for the splash of rain, the klepsydra that times their resurrection, no one can tell ; but this is certain : the voluntary prisonment is long. When disturbed they are loth to labor, and soon after the first rains the silken rings are broken, the doors are opened, and the young disappear from the nests—the summer sleep of the old is over, and the young go forth to struggle for existence and to experience the joys and sorrows of a spider's life among the foot-hills.